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UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

Agenda Item: D.13

Republic of South Africa

TECHNIQUES AND MATERIALS FOR THE PROVISION OF MASS LOW-COST HOUSING AND ASSOCIATED FACILITIES

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Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

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TECHNIQUES AND MATERIALS FOR THE PROVISION OF MASS LOW-COST HOUSING AND ASSOCIATED FACILITIES

No.431

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1. Introduction

(a) Just as the development of a country is dependent on the development of its natural resources and industrial activity, so also are these inherently dependent upon the development of the country's human resources. Good housing and the provision of spaces and buildings for use in education, health services and recreation are essential requirements in building up stable, healthy and industrious communities. It is obviously of prime importance, therefore, that the problems of housing and community facilities in a developing country should receive priority consideration.

(b) The development of countries in Africa has assumed astounding proportions during the past decade and the most extensive and urgent problems of housing are to be found in villages and towns where the rates of population increase have generally far outstripped any planned rate of urban growth. Settlement in the villages and towns has taken place, and continues to do so, regardless of whether housing and related amenities are available. New arrivals overcrowd already congested quarters or erect shacks, using whatever discarded or cheap materials are readily available, on any vacant piece of ground they come across, no matter how small this may be or how unfavourably it may be situated. Most often such dwellings are erected chaotically at high densities, so creating squatter shanty towns which offer little or nothing in the way of security, hygienic services or adequate amenities, and which consequently create breeding grounds for ill health, discontent, moral degeneration and crime.

(c) Furthermore, the problems in Africa are intensified because of the general

state of poverty amongst migrants to the towns[1]. In the first instance, the newcomers usually have no special skills which can earn them anything more than the lowest wages. New skills must be mastered and these often require long periods of training and experience. Previous outlets for providing the essential needs of the family can no longer be utilized; crowded conditions and lack of ground prevent these people from keeping animals or cultivating crops, even on a very restricted basis, and they can no longer build their houses on the traditional pattern as the required space and materials are not available. Secondly, their plight leaves them wide open to extortion by unscrupulous dealers and landlords. Unfortunately, even when the newcomers become adapted to urban living and their earnings increase, the change in emphasis from a rural economy to a largely monetary economy imposes on them their greatest problem, that of budgeting between pay days. Materialism as a status symbol in the form, for instance, of the possession of an expensive piece of furniture or of partaking in social amenities, often takes precedence over the provision of the basic necessities of life. Frequently, therefore, their deficiencies in housing, clothing, food and fuel remain with them for many years unless they are helped in some way.

(d) Whereas education and guidance are the only tools that can be used to teach people how to spend their money rationally on clothing, food and fuel, more positive assistance can be rendered by providing them with adequate housing at the lowest possible cost. This assistance should not be the sole responsibility of the local authority in each town or village; the work involved and the financial implications of providing satisfactory buildings on an extensive scale for housing, education and health services is, in most cases, beyond the capabilities of these authorities if they are left to act on their own. A national approach is therefore most desirable in helping to find solutions to the numerous common problems associated with overcrowding and slum conditions. In fact, it could be said that a national effort is a necessity, as slums are essentially a product of poverty, and in African countries poverty is not a localized problem but a national one. A national attack on the problems would also obviate the duplication of effort that would otherwise occur. A central body could organize and sponsor all research on the planning and technical requirements of housing and, from the data thus obtained: formulate standards for housing, town-planning and the provision of services; prepare specimen drawings and specifications; assist in developing the manufacture and use of building materials using local resources; introduce schemes for training the required labour forces; and provide a system for financing housing schemes.

2. The need for research

(a) In order to approach the low-cost housing problem intelligently and to establish policies on a sound long-term basis in the interests of a country's development, it is imperative that planning should be based on fundamental information obtained from investigation and research[2]. Such information must lead to planning that is both sound and economic. In some cases it may be possible to modify the research findings obtained in one country to suit their application to the conditions existing in another country, but in other cases the information needed will only be obtained by undertaking research into specific conditions in each country separately.

(b) Thus, for the broad development of a country, surveys should be made of the natural resources, their location and the possibilities of economic development

so that the data can be interpreted in terms of housing development and the establishment of new towns and industrial areas.

(c) For housing generally, it is necessary to undertake research and acquire information on the following aspects: minimum standards of accommodation applicable to the circumstances in a country, not only to meet essential human needs but also to ensure decent family living; number of families to be housed, their size and composition, their income, expenditure on essential needs and living habits, in order to obtain a reliable assessment of housing requirements and maximum rents that families can be expected to afford; housing densities, township layouts and soil conditions; structural performance requirements and testing techniques to ensure the safety and health of the occupants in relation to the possible effects of wind, hail, rain, fire, heat and cold; health and hygiene aspects of house design [3]; the quality and durability of materials to ensure that the structures will remain sound with little maintenance for a long period and will have a good market value; the problems of locally produced materials; and the development of new techniques and methods of construction.

(d) In South Africa, for instance, research on low-cost housing [4] contributed considerably to paving the way for a greatly accelerated country-wide activity in building large numbers of houses. In 1960, from Government funds, over 23,000 houses were built for the less-privileged peoples and over 157,000 during the 10-year period up to 1960. The research was organized by the National Building Research Institute on the basis of a large team effort working in close co-operation with many persons, organizations and housing authorities who had special knowledge of, or interest in, matters relating to housing and building. In this way a great deal of research was carried out within a period of a few years on aspects such as those mentioned above. The construction of experimental houses and even townships assisted in demonstrating the research findings and accelerated their application on a wide scale. It also initiated a process of further reducing the costs of materials and increasing production efficiency on building sites.

(e) All these activities were largely responsible for providing housing of very good standard at as little as half the cost that applied before the research was undertaken and for maintaining the costs at about these levels in spite of a continuous rise in costs in all other spheres of building. The advantages of the reduced costs have been three-fold:

(i) the Government has been able to house about twice as many families as previously for the same sum of money;

(ii) the loans are more secure, as two families now repay the sum previously borrowed by one; and

(iii) the tenant or home-owner has a better dwelling at a much reduced rental or repayment rate.

3. Research and techniques used in planning

(a) Materials resources

(i) In the broad issue, regional surveys of sources of raw materials for use by industries or for consideration of the possibilities of establishing industries should be made, and obviously the information

would have an important bearing on planning for the development of towns, including the siting of new towns.

(ii) In addition, however, it will always be important to make surveys of the possible sources of local materials which might economically be used to produce suitable building materials. In most less developed countries many manufactured building materials have to be imported and are therefore available only in limited amounts. The development of the production of suitable alternative materials at a competitive price will thus reduce expenditure on foreign goods and could at the same time provide employment and more earnings for people who would otherwise remain in the very low income bracket. As an example, investigations are being made in South Africa of the suitability and potential supply sources of clays for making bricks, hollow clay blocks, tiles and other building units.

(iii) Moreover, such research must stimulate studies to develop processes for the manufacture of materials, especially taking into account the lack of local skilled labour, and of the performance of the final products when exposed to local climatic conditions, including particularly high temperature, humidity and solar radiation. Examples of valuable work in this regard are the exploitation of the pumice deposits in the Rift Valley near Nairobi for light-weight concrete houses and the use of coffee husks as fuel for producing good quality burnt clay building units near Kampala.

(iv) Another interesting illustration is demonstrated by the work in South Africa which led to the establishment of an industry to produce slag cement from blast-furnace slag which was previously dumped as a waste material at some cost to the iron and steel manufacturer[5]. This "waste" material is now sold to the cement manufacturers. The slag produced in the country has an unusually high magnesia content and information available from overseas indicated that such slags would not produce a suitable product for use as cement. Nevertheless, a research study proved that a good cement could be manufactured. Further research is now in progress aimed at improving the quality of the cement and the methods of using it in building.

(v) In some countries reeds which grow along river banks could be used for producing good quality walls, roofs and ceilings. A simply operated machine is available which bundles reeds tightly together to form a continuous 'mat' of any desired thickness up to about 4 inches, and this 'mat' is easily cut to the required lengths. The material is reasonably rigid, can easily be fastened to framing, and takes a plaster finish satisfactorily.

(b) Soil mapping and soil investigations

(i) In many parts of Africa soil conditions are encountered which may lead to the cracking of structures erected on these soils[6]. This may affect the safety of the structures but in any case it means high repair and maintenance costs. Obviously, therefore, it would be desirable to avoid building on such soils or, if it cannot be avoided,

to design the foundations and structures so that they will remain safe and will require little maintenance. The problem soil conditions are:

a. the so-called "heaving" soils, which swell or otherwise change their volume, particularly after a building has been erected on them;
b. collapsing sands, which often adequately support a building while dry but quickly compress to a smaller volume when wet; and
c. sink holes, which may form suddenly, causing the ground surface level to drop anything up to several feet.

(ii) A relatively easy and low-cost technique for determining whether such soil conditions occur in fairly large areas where building development is proposed is that of soil mapping, effected by interpretation of the features observed in stereoscopic studies of aerial photographs. Recent studies in South Africa have shown that soil maps of an area can be produced rapidly and that the boundaries of the engineering soil types can be established with a satisfactory degree of accuracy. The next step is to carry out a field investigation, which includes taking soil samples and determining soil profiles by means of test pits, so that an indication may be obtained of the engineering properties of the soils and of their probable behaviour in relation to structures which might be built on them. However, some research might first be required on the soil types in a country to study their engineering properties and to establish what relationships these may have to soil behaviour and foundation design.

(iii) It is also necessary to carry out experiments on structural design for buildings that have to be built on unstable soils. There are many design methods that may be employed but the chief problem is to find one which is sufficiently economical for low-cost building.

(c) Socio-economic surveys

(i) Excellent survey techniques [7] have been developed to establish trends in average family sizes, and family size distribution; family composition in terms of parents, number and sex of children and of other persons who live with the family; preferred living practices and usage of space. Information based on such surveys of communities to be housed is vital to satisfactory design and planning of mass housing estates and it is strongly recommended that persons who know the people and conditions intimately should be trained to do this work.

(ii) The surveys should be designed to include information on family income and pattern of expenditure, thus making it possible to establish the minimum expenditure that different sizes of families must meet in order to provide the minimum necessities for a healthy, decent life. This comprises expenditure on food, clothing, fuel, cleaning materials, transport to work and medical care. By comparing this necessary minimum expenditure with the total legal earnings of a family it is then possible to assess the ability of the family to pay rent. Trends in rent-paying ability will therefore represent the measure for assessing the costs of the housing to be provided.

(d) Minimum standards of accommodation

(i) Minimum standards of accommodation must be related to the needs of both the individual and the family to make it possible to lead a healthy, decent, family life. Standards that apply in some countries may not be appropriate to others because of important differences in conditions, particularly climatic conditions. Space standards must be related to the necessary furniture and storage requirements and to the performance of all the functions required to live decently in the climate concerned. Furthermore, such design factors as ventilation, daylighting, roof and wall insulation and orientation require careful consideration when establishing minimum standards that are suited to the climatic conditions. The most satisfactory way of establishing such standards is for specialist study groups and research teams to collect all the relevant information and to assess it in relation to conditions in the country concerned.

(ii) The following minimum standards of accommodation were established in this way for South Africa (only the main features are given here):-

a. Room areas:

No. of persons accommodated	Type of dwelling	Room areas in square feet			
		Main bedroom	Bedrooms	Dining/ Kitchen	Living/ Sleeping rooms
2	Aged couple unit	-	-	70	110
2 to 3	One-roomed unit	-	-	70	118
4 to 5	Two-roomed unit	118	-	80	115
6 to 7	Three-roomed unit	118	94	90	120
8 to 9	Four-roomed unit	118	94	100	125
10 to 11	Five-roomed unit	118	94	100	130

b. The dining-kitchen, bathroom and store are not counted as rooms.

c. Bedrooms may be 5 sq. ft. less in area if built-in cupboards are provided.

d. In the kitchen 13 sq. ft. of shelving and 6 sq. ft. of working top, which may include the sink, are required.

e. Storage must be provided and if a coal stove is installed there must also be fuel storage space.

f. Individual latrine facilities must be provided for each dwelling unit.

g. A satisfactory supply of potable water must be available; and if this is supplied through stand-pipes, these must be not further than 500 feet from any dwelling.

h. Where bathrooms of a minimum area of 30 sq. ft. are not included in the dwellings, ablution blocks with hot water supply, providing 8 shower points and 8 washtubs for each 100 dwelling units, must be supplied.

i. Notes on ventilation, sizes of windows for sufficient daylighting and minimum ceiling to floor height of 8 ft. 6 in. average are also included.

(e) House plans and estate layouts

(i) Information based on socio-economic surveys and minimum standards of accommodation enables an intelligent approach to be made to the development of minimum house plans and of estate layouts, allowing for maximum economies to be achieved while meeting all the requirements. This work must be done in conjunction with cost studies on all aspects of building and town planning.

(ii) For instance, this procedure was applied on a thorough scale to mass housing in South Africa about ten to twelve years ago and a number of minimum house plans were produced which allowed the lowest costs in building the houses, whatever method of construction was used. Many thousands of houses have been built to these plans, or slightly modified versions of them, both in South Africa and other African countries, and possible suggestions for modifying the plans to allow further savings have been very few.

(iii) In the work of developing township plans, density studies provided the main criteria. They indicated that the necessary land for schools, clinics, playgrounds, sports fields, churches, shops etc. should be made available in the planning development. Rationalized street widths were recommended and proposals made on the safety of children going to school, the design of water supply, sanitation services and street lighting. Standards for minimum but adequate spacing around houses and other buildings were formulated and schemes were devised for landscaping and for the planting of trees so that they could be cared for by individual families. Up to the present the building of dwellings of more than one storey has not proved economical. However, as a result of recent developments in building and in providing services, the possibilities of including two- and three-storey dwelling units or terraced maisonettes were re-considered. Preliminary indications are that, although construction costs may still be a little higher than for equivalent single-storey dwellings, the difference may be offset by savings in the services.

(f) Quality and performance standards for structures

(i) The general practice for controlling the quality and performance of structures is to lay down regulations which specify what materials and methods of construction may be used. Such specification-type regulations, while being easy to apply, have a number of serious disadvantages particularly when applied to mass low-cost housing. The chief disadvantages are that they do not readily permit the use of new materials or of new and unorthodox methods of construction, developments in which can frequently introduce substantial savings in mass building costs.

(ii) The problem has been overcome in South Africa and some other countries by formulating, through research studies, minimum technical performance requirements for structures and by developing methods of testing or assessing the performance of structures[4]. These are designed to provide the following:-

a. Structural stability: the building should be able to withstand all forces which it can reasonably be anticipated that it might be exposed to during its economic life, e.g. wind pressures, the weight of workmen effecting repairs and the impact of furniture, kicking, slamming of doors etc. Other special forces, such as heaving soil conditions or hail impact, must also be considered.

b. Thermal performance: the building should be so constructed that the thermal environments which result inside the structure, will not be so severe as to affect adversely the health and working efficiency of the occupants.

c. Rain resistance: the construction should be such that, for the weather conditions to which it will be exposed, no more than a maximum allowable rain and dampness penetration to the interior will take place.

d. Durability: the durability of the materials and method of construction should be such that the maintenance costs are not unduly high and the other performance characteristics of the structure are not seriously affected during the economic life of the building.

e. Other requirements: the construction should be such that it does not constitute an unreasonable fire hazard, that it does not encourage the harbourage of vermin, and that it can easily be cleaned and disinfected.

(iii) This procedure readily allows the use of any materials and any method of construction provided only that the performance of the completed structure satisfies all the requirements. It thus ensures that the structures will remain satisfactory for many years and will maintain a good market value.

4. Operational Techniques

(a) Careful investigation and experimentation with both labour and building and site organization can lead to substantial savings in housing costs. In underdeveloped countries the lack of trained labour for building is usually a very serious handicap to progress on mass housing, and normal training facilities are inadequate to meet the situation.

(b) A system developed for training local labour rapidly on the job has proved to be highly successful in South Africa. It was found from tests that in many cases the man-in-the-street has a good natural ability to perform one building task or another, such as laying bricks, cutting timber, mixing or pouring concrete or making sand-cement blocks. For instance, by giving such a man the simple task of straightforward bricklaying between pre-laid corners in a wall and showing him the correct methods, it was found that after about one day's training he could satisfactorily undertake this task on his own. With a little more guidance he could usually increase his productivity to a fairly high level within a few weeks. After some months of doing this particular work on a succession of houses under construction he could generally be given instruction on the more difficult task of, say, forming the jambs against a door frame. In this way, teams of building operators, each repeating only one particular type of task on a series of structures, were rapidly trained while they were doing all the building themselves.

(c) This system of on-site training could be regarded as one of organized self-help. People build houses for themselves and their fellow-men while they are learning and they are paid for it at the same time. It provides a means of employment and of earning sufficient money to relieve the poverty in an otherwise very low income group.

(d) Even if this system is adopted, the possibilities of industrial systems of construction should also be investigated - such as the rapid fabrication on site of large wall or roof elements, the casting of whole wall sections on the ground and later lifting them into place, in situ casting of walls etc. Such methods often allow worth-while reductions in building costs.

5. Materials

(a) Studies and experimentation provide the best means of developing and using suitable materials for low-cost housing. A few illustrations are given here.

(b) Concrete building blocks are widely used in Africa for low-cost housing and general building, yet it is not a simple matter to produce good quality blocks or to build them into walls that will give satisfactory performance in all respects. Cracking in walls built of concrete blocks is frequently encountered and often leads to rain penetration, and safety and maintenance problems. Investigations have shown that the cracking is generally caused by dimensional changes in the blocks, resulting in mortar joints and even blocks themselves cracking; that the problem can only partly be overcome by improving the manufacture and curing of blocks; and that it is necessary to follow certain precautions when building them into a wall.

(c) To reduce the progressive shrinkage normally associated with cement products after they are manufactured it is necessary to use good quality materials; to use the correct proportion of cement for the particular materials used; to use the right water/cement ratio; and to cure the blocks under damp conditions for an adequate period after manufacture. Factors associated with any wetting and drying cause volume changes of the block, even long after the blocks have been made. For this reason the units should be quite dry when laid and not wetted as is common practice when laying bricks. The wall should be protected from rain during building and should also be allowed to dry out before it is plastered.

(d) The best compromise of procedures to suit a particular building project should be worked out by tests and experimentation. Furthermore, it might be necessary to find suitable waterproofing treatments to apply to the completed wall.

(e) Galvanized steel roofs are another common item in low-cost housing. At some stage, however, it becomes desirable to paint the roofs so that their life can be extended. In South Africa it was found that available commercial paints only had a durability of a few years. A study undertaken to develop new paint formulations that would provide effective protection to the steel for a very much longer period, was very successful in producing two formulations, one based on dehydrated castor oil and the other an acrylic type paint[8]. Suitable systems for painting timber exposed to the different climatic conditions in the country are now being developed.

(f) A further interesting study in progress is aimed at the production of low-cost timber houses using short lengths of locally grown timber. Quantities of short lengths of timber result from cutting logs in sawmills and there is practically

no market for them. Very few timber houses have been built in the country and consequently there is little experience of the problems involved and of the performance of such structures. The work therefore involves the development of suitable low-cost methods of construction and design aspects to ensure that the structures will meet the accepted minimum performance standards in relation to the climate.

6. Township Services

(a) Apart from studies to define design standards for the various services in a township and to indicate economical methods of providing the services, there is another important aspect which usually arises after a housing estate is completed. Economic rentals for the houses must cover the redemption and interest on the loan for the house plus the costs of engineering and other services in the township and the costs of administration. The portion due for the services etc. is often very much greater than that due for the structure itself and studies to reduce the costs of services could therefore be very fruitful in reducing the payment burden on householders and in over-all planning of the economies of housing.

(b) In under developed countries, methods of providing hygienic sanitation at low-cost usually present problems which are very difficult to solve. Among various possibilities, attention is being given in Africa to ponding as an economical and effective form of stabilization of waste waters for small towns and villages. The design of the ponds has been based on American practice which, unfortunately, is often inadequate for local conditions. A joint study carried out in South Africa and Rhodesia has now provided a theory and information on its application in practice which, it is hoped, will rationalize the design of such ponds[9].

Conclusions

(a) The rate of development in a country depends a great deal on the development of its human resources. Good housing and the provision of spaces and buildings for use in education, health services and recreation are therefore essential requirements in building up stable, healthy and industrious communities.

(b) In most of the countries of Africa, for instance, the pace of urban growth has continued to increase rapidly but has far outstripped the rate of planned development and has resulted in numerous slum areas. Consequently, the need for the provision of low-cost housing on a large scale is very urgent. The housing policy in many less developed countries has concentrated on accommodating the emerging middle classes of government officials, etc. resulting in relatively high costs for this partial attack on the problem. The solution demands a co-ordinated programme for housing on a national basis, based on factual information from research and experiment. Studies already made in some developing countries have indicated approaches which have led to successful procedures and techniques for obtaining valid solutions. It is suggested that these approaches might be usefully adopted in other under developed countries.

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SUMMARY

Agenda Item: D.13.

Republic of South Africa

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By S.J. RICHARDS, M.Sc.,
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SUMMARY

For the general development of the less developed areas, utilization of the large potential of human resources is seen as a primary necessity. For this, good low-cost housing, and spaces and buildings for use in education, health services and recreation, are essential requirements in building up a stable, healthy and industrious community. The small amount of prestige housing being done in many parts of Africa, for instance, to accommodate people like government servants in some of the emerging middle-income groups, is only a minor contribution towards solving the problem. What is really required is the provision of mass, low-cost housing for the large numbers of families with very low incomes. In Africa the major problem arises from the rapid growth, during the past decade, of urban populations and from the state of general poverty - factors which have combined to create numerous large slum areas.

To achieve its purpose mass housing must provide for healthy and decent family living, and it should be so carried out that it will represent an asset for many years to come and not degenerate into slums in the future. Solutions to the many problems of planning and building good housing on a large scale at as low a cost as possible, necessitate a co-ordinated programme for housing on a national basis and factual information obtained by research and experiment.

Various aspects of research, and techniques used in planning and building low-cost houses, are discussed and illustrated with examples of successful approaches that have been evolved in some countries.

Studies of the country's natural resources are important, in order to find materials which could be used in building; as are investigations to develop the use of these raw materials for the manufacture of good quality durable building products. An interesting example quoted concerns work in South Africa which has led to the industrial production of slag cement from waste blast-furnace slags containing a high proportion of magnesia.

Soil mapping and soil investigations are considered important prerequisites for planning, because of the serious damage to buildings that can be caused by unstable soils such as heaving clays, collapsing soils and sink holes. Methods for identifying these soil types and for testing the engineering properties of soils, and foundation and building designs to suit certain unstable conditions have been developed through research.

Excellent techniques have been evolved for socio-economic surveys to establish trends in size and composition of families and in preferred living practices and the use of space. Surveys should be designed to include data on family incomes and patterns of expenditure, so that rent-paying ability can be assessed. It is recommended that persons who know both people and conditions intimately should be trained for this work.

The formulation of minimum standards of accommodation and minimum house plans, and the principles underlying economic planning of housing layouts and townships, are briefly discussed. The minimum standards of accommodation applied in South Africa are given.

It is suggested that standards to control the building of low-cost houses are best applied in the form of tests of minimum performance under the climatic conditions concerned, for structural stability and durability, resistance to rain and fire, and thermal performance. In this way new materials, or new methods of construction, can be readily assessed and taken into use.

Because the shortage of trained labour is a serious handicap in less developed areas, ways must be devised of using local labour as efficiently as possible. A system of controlled self-help for building houses is described, whereby local labour is rapidly trained while actually building the houses required and earning money for doing so.

Suggestions are made for overcoming problems connected with concrete blocks for walling. Other work described was aimed at developing roof paints with the desired durability, or at the use of short lengths of timber for building low-cost timber houses.

Mention is also made of developments in Africa in the design and use of stabilization ponds for waste water and sewage disposal for small towns.

It is finally recommended that many of the approaches and techniques outlined in the paper could be adopted with fruitful results in other less developed countries.

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United Arab Republic

METHODS OF IMPROVING THE QUALITY OF LOW GRADE EGYPTIAN COTTON PRODUCTS, THROUGH IMPROVED METHODS OF PROCESSING

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METHODS OF IMPROVING THE QUALITY OF LOW GRADE EGYPTIAN COTTON PRODUCTS, THROUGH IMPROVED METHODS OF PROCESSING

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Introduction

1. Lower grades of Egyptian Cotton varieties as designated in this paper are largely locally consumed. The economic importance of these cottons is obvious since they represent about 12% of the total cotton production, which will affect directly the income of the farmers and to some extent the total national income.

2. Technological advances, research work and organized State control in the field of cotton growing are carried out with the aim of:

(a) improving seed selection and supply

(b) improving the existing varieties and replacing the degenerated strains by others of better physical characteristics and of higher yields

(c) improving agricultural, picking, ginning and handling methods

(d) enforcing the fighting campaign against disease and insect pests to protect the crop on one hand and to raise its average grade on the other

3. These efforts have led not only to maintaining the famous characteristic of the Egyptian cotton but also to increasing the average grade of the crop thus decreasing the amount of low grade cottons from year to year.

4. The lower cotton grades are as stated before locally consumed in producing fabrics cheap enough to be within the buying power of the lower income groups of the population. The quality of these fabrics however has been much improved through improved methods of processing in the various spinning, weaving preparation, weaving and finishing operations. The fabrics thus produced are better in appearance and handle, more attractive and readily saleable.

STATISTICAL DATA OF THE LOW GRADES EGYPTIAN COTTON VARIETIES

5. Table I gives particulers of the Egyptian cotton production data, over the period from 1954/55 to 1961/62, for the various staple lengths, and, is classifieid under 2 main groups:

(a) lower side of the grade scale which starts from Fair (F) to Fully Good Fair/Good (FGF/G) inclusive.

(b) higher side of the grade scale which starts from Fully Good Fair/Good (FGF/G) to Extra (E) inclusive.

6. Study of Table I will readily show that the percentage of the F to FGF/G group is highest for medium staple varieties ranging from 9% to 16% with an average of 12.6%, while for the long staple varieties the percentage is lowest ranging from 2% to 6% and averaging 4%. The corresponding percentage range for the long-medium staple varieties is from 3.6% to 16% with an average of 8.8%. The table also shows that the below grades group namely, mixed, low mixed and scarto represent about 3.9% of the total production. The low grades of Egyptian cotton will include the F to FGF/G group and the below grades group having a range from 8% to 16% and averaging 11.7% or the equivalent of 45000 tons/Annum.

7. Table II, gives particulars of the local cotton consumption classified in the same manner as Table I, over the period from 1955/56 to 1960/61.

8. Reference to Table III shows that the bulk of the low grades is consumed locally. The importance of these statistics is obvious since the substantial amount of 45000 tons of low grade cottons will roughly make up for about 30% of the total present local cotton consumption.

9. Several Egyptian Textile Mills, working for home trade, have been able to handle these cottons successfully to produce rural quality fabrics through the adoption of the contemporary technological advances in the fields of spinning, weaving, and finishing processes.

SURVEY OF PRACTICE ADOPTED BY SOME TEXTILE MILLS IN PROCESSING LOW GRADE EGYPTIAN COTTONS

Spinning and Weaving.

10. The quality of the fibres of the low grades is characterized by the high percentage of short, immature and dead fibres; the tendency to be on the coarser side of the fineness scale and the higher proportion of impurity contents. To deal with such fibre characteristics in the spinning processes, the following procedures should be carried out:

(a) Because of the lack of resiliency of immature and dead fibres, in addition to the higher impurities contents, careful handling, efficient opening and cleaning in the blowing room machinery would be a necessity, otherwise neppiness and

appreciable fibre-entanglement would result and yarn appearance and uniformity will be deteriorated.

(b) Careful handling of the material will also be necessary on the carding machines and special procedures should be adopted to give better carding conditions to the effect of minimizing nep count and having a carded sliver with better fibre isolation.

(c) Under normal working conditions, the nep count and degree of fibre isolation in carded slivers produced from low grade cottons, are appreciably inferior to slivers produced from the higher grades. This creates difficulties in drafting and the product would inevitably be irregular. These difficulties could be partially overcome by the utilization of efficient drafting systems on drawing, speed and ring frames.

11. The current practice of processing the low grade cottons in some of the UAR Textile Mills may be surveyed in the following:

(a) In the blowing room the following arrangement was found satisfactory:

(i) Any modern line of blowing room machinery with about five major cleaning points, would be able to satisfy the present requirements if suitably adjusted and modified. Speeds and settings of all spiked lattices in hopper feeders and hopper openers should be adjusted to minimize idle time, hence ensuring more efficient opening. Suitable combinations of porcupine, kirschner and saw-teeth type beaters is used in preference to severe action beaters such as bladed beaters.

(ii) For medium and long-medium staple varieties, a crighton opener is generally used, and its position in the line should be directly after the bale openers. For long staple varieties, this type of opener is generally by-passed.

(iii) Strict blending procedure is planned and adopted to ensure the homogeniety of the material from day to day during the season.

(iv) Lighter scutcher laps in the order of 400 gr/m, would be more satisfactory.

(b) For the carding process, the following arrangement is generally adopted:

(i) Raising the taker-in speed up to 650 r.p.m. and slowing the doffer speed down to about 5 rpm at a production rate of about 4 Kg/card/hr.

(ii) Normal carding machines' settings are maintained, except: the setting between the taker-in and mote-knives should be closer, the settings of the front and back sheets should be appropriately accessed to minimize the nep count.

(iii) Metallic card clothing is preferable or else, the ordinary flexible foundation card clothing could be used successfully if the carding machine is fitted with a continuous stripping device. This procedure was found to give a fairly good carding condition. The nep count in the resulting card slivers did not exceed much that of the scutcher laps. The doffer web appearance was, also improved due to an improvement of web cloudiness.

12. As already mentioned, the draftability of the resulting card sliver suffers from the lesser degree of fibre to fibre isolation and from the higher nep count. This necessitates efficient drafting systems on drawing, speed and ring frames. The following drafting systems proved to be satisfactory: 3 over 4 drafting on the drawing frames, 3 over 4 or MS-2 Platts type of drafting on speed frames and double apron drafting system on the ring frames.

13. The yarn count normally spun from the low grades ranges from 10's to 30's (English count) with an average of 16's. Naturally, the quality of yarn produced depends in the first place on the type of blends utilized. But, generally the quality is inferior; in appearance, cleanliness and strength in comparison with the standard qualities spun from the higher grades of Ashmouni. The yarn strength is lower by about 10% to 20%, while the yarn appearance varies from grade C to grade D of the ASTM standards.

14. In order to maintain the efficiency of modern high speed automatic looms to a rational level, prime consideration should be given to yarn clearing and warp preparation, especially sizing.

15. The quality of the produced grey fabrics, although substantially improved, yet is inferior in appearance, cleanliness and handle. The finishing processes in their widest applications play an important rôle in raising the quality, enhancing the appearance and handle of the cloth, thus rendering it more attractive and readily saleable.

Finishing.

16. In general terms, the main finishing processes includes: scouring and bleaching, mercerising, dyeing, printing and dressing or finishing proper. The relative importance of these various finishing operations and how to get the maximum benefit of each process, if applied to the low grade cotton fabrics may be given in the following:

(a) Bleaching: May be considered as the basic operation in textile finishing processes and on its efficiency depends, the success of all subsequent operations. Low grade cotton fabrics, naturally contain higher percentage of sizing material, more impurities such as seed-particles, trashes and the like, and are of more hairy texture.

This class of fabrics should be given careful consideration with regard to brushing and shearing, to remove by mechanical means the most part of impurities, knots and hanging threads.

(i) The cleaning machine should be equipped by both, emery and bristle or nylon-brush rollers. For higher production rates, modern shearing machines are used.

(ii) Sigeing follows to clear the surface fibres and fuzzes, and this process is performed on either, gas or plate singeing machines. Uniformity of gas flames across the width of the fabric, is essential, or else, irregularities in the degree of dyestuff absorption would result, thus leading to unlevel-dyeing.

(iii) For the removal of the sizing materials previously applied to the threads during the warp preparation, an efficient disizing operation is imperative for the success of the subsequent bleaching and dyeing processes as insufficient desizing would lead to bad penetration of dyestuffs and unlevel-dyeing. In case, a water soluble size is used, such as soluble starch, carroub gum, alginate or c.m.c., washing with hot or lukewarm water would be sufficient to remove the sizing material. In case non-soluble starches were used, enzymes such as diastase or bactolase are essential.

(iv) For low grade cotton fabrics, where higher impurity contents are present, a good scouring operation would be necessary. Scouring is best done in pressure circulating kiers, with the addition of 3% caustic soda (by total weight of cloth). The addition of sodium silicate is beneficial, in case of dirty cloth, as it helps to keep in suspension the dirt particles removed from the cloth by scouring. The addition of surface active products, is recommended when the cloth contains oily stains; the best result may be obtained by the use of mixture of an ionic and non-ionic surface active agents.

(v) With a scouring procedure as outlined, bleaching would be an easy operation and is generally performed, either by the use of hypochlorite or peroxide of hydrogen. The latter gives a better permanent white but is more expensive. In case the cloth is to be treated with resin, a hydrogen peroxide bleaching is recommended, because, yellowing of fabric during curing is thus prevented.

(b) Mercerising: Generally, mercerisation is not practiced on low grade cotton fabrics with the purpose of obtaining lustre as the result does not give a satisfactory account for the process expenses. But, a semi-mercerisation is oftenly used for manifold purposes:

(i) increasing dyestuffs absorption in dyeing and printing, due to the activation of cotton cellulose.

(ii) removing rope creases in cloth, when bleaching is carried out in rope - form, espcailly with crowded

construction fabrics, in which case creases tend to be permanent and show clearly after dyeing.

(iii) reducing the bad response of dead fibres to dyeing and thus leading to more levelled dye shades.

(iv) increasing the tensile strength and elasticity of cloth, thus leading to better wearability.

On the whole, mercerisation enhances the all-round properties of the fabrics and makes them look richer. Mercerisation may be performed on either the grey or bleached goods. In the first case, better results are obtained if the cloth is desized and with the addition of a penetrant to assist the absorption of caustic soda.

(b) Dyeing: Contrary to the common belief, low grade fabrics, should be dyed with dyes of fairly good fastness to both washing and light, as such fabrics would be subjected in their intended uses, to longer rate of wearability, more repeated washing and more exposure to sunlight. For this purpose, the most appropriate group of dyestuff, is the insoluble azo dyes, commonly known as the naphtol colours. This dye group acquires besides their fastness a high degree of brilliancy.

17. Another recommended group of dyestuffs, would be the fast to light direct colours and the after treated direct colours. Both groups give a fairly good fastness to both light and washing.

18. Sulphur dyes may be used with satisfaction for most of the dark shades, such as: olives, khakies, browns, navy and blacks. Almost all sulphur dyes are of good fastness to washing and to light.

19. Aniline black presents one of the fastest black colours, and is in the same time, cheap in cost price. Although its use reduces the tearing strength of the cloth, yet, it is the most widely used black.

20. The resistivity of immature and dead fibres to the absorption of dyestuffs represents a major difficulty, encountered in dyeing. Semi-mercerisation as already mentioned, would help to a certain extent in solving the problem. The rest depends on the appropriate selection of the group of dyestuffs to be utilized. Most of dyestuff manufacturers give a selection of dyes which are most suitable for this purpose.

(d) Printing: Printing process, by its nature, tends to cover almost entirely, the imperfections in the cloth texture, and thus, it is considered to be the most appropriate process for low grade cotton fabrics. To this effect, rural qualities are generally printed in patterns which cover most of the surface of the cloth, thus concealing the above mentioned defective texture.

21. The most suitable group of dyestuffs is the naphtol, Vat dyestuffs are utilized for less covered surfaces, such in case of stripped patterns for pyjamas and shirting material.

22. Pigments are also used for this class of fabrics, to give brilliancy effects. They are easy to apply and have a good cover, but unfortunately, the prints obtained, generally suffer from low rubbing fastness, and where hand washing is used, the utilization of pigments is not recommended.

23. Reactive dyes are rather expensive to apply in this case, but they are utilised in some cases, where a great degree of brilliancy is called for together with good fastness.

(e) Finishing and dressing: The finishing proper is a designation given to all mechanical, physical and chemical processes, which are applied to the fabrics, in order to endow them with special properties, either temporary or permanent with the purpose of enhancing the final handle and appearance.

24. Among the various effects obtained from the finishing processes, the following are considered, representing the common practice:

(i) Filling: The filling material, commonly used is starch and dextrine, glue is also added in small amounts to increase stiffness. This type of finish is not permanent, and usually disappears after one or two washings. If a permanent finish is required as in the case of jupons and collar-linings, synthetic resin should be used, either alone or in combination with starch.

(ii) Softening: In case of a soft finish is required, softeners such as: turkey red oil, or synthetic softeners are added to the dressing composition.

(iii) Optical Whitening: Agents are often added to the dressing composition, to increase the degree of whiteness for white goods or printed goods with white grounds.

(iv) Lustering: High gloss is obtained by friction calenders. Medium lustre is obtained by normal calendering; while subdued lustre is performed by Schreiner calenders, which are usually applied to sateens and drills. A special calendering effect, known as chasing, is utilized to enhance the cover of low grade cotton fabrics and render them fuller in handle. This is effected by passing several layers of the cloth, one upon another between the rollers of the calender.

(v) Raising: Is one of the most important and successful finishes that could be applied to low grade fabrics, the advantage being that raising conceals almost entirely the inperfection of fabric texture. Raised cloth is very popular in UAR during winter time, thus representing a big field of utilization.

(vi) Surface coating: Apart from clothing purposes, low grade cotton fabrics are coated with starches as in the case of book-binding; or with synthetic resins, specially polyvinyl-

chloride or acrylic resins to produce synthetic leather which has manifold applications in industry and household utilities.

(vii) Flocking: Low grade fabrics are much used nowadays, as a ground for flock, which gives an imitation of velvet, and cover at the same time, all imperfections present in ground fabrics. This type of finish is acquiring an expending field of applications such as in the production of jackets, shoes, ladies bags, lining of suitcases, wall coverings and the like.

TABLE III

ANNUAL TOTAL PRODUCTION AND LOCAL CONSUMPTIOM OF LOW-GRADES EGYPTIAN COTTONS

S E A S O N	Low-Grades up to FGF/G ⁺	
	Production	Consumption
1955 / 1956	53508	46661
56 57	41920	58163
57 58	50361	56196
58 59	53114	63180
59 60	43700	31756
60 61	38132	25386
Total	280735	281342
Average	46789	46890

⁺ Including: mixed, low mixed and scarto quantities

TABLE "I"

PRODUCTION STATISTICS OF EGYPTIAN COTTONS CLASSIFIED BY GRADES AND STAPLE LENGTHS

SEASON	LONG-STAPLE VARIETIES					LONG-MEDIUM STAPLE VARIETIES					MEDIUM-STAPLE VARIETIES					TOTAL OF ALL VARIETIES				MIXED LON MIXED & SCAKTO		GRAND TOTAL
	Up to FGF/G		FGF/F to Extra		TOTAL	up to FGF/G		over FGF/G to Extra		TOTAL	up to FGF/G		over FGF/G to Extra		TOTAL	up to FGF/G		over FGF/G to Extra				
	Tons	%	Tons	%	Tons	Tons	%	Tons	%	Tons	Tons	%	Tons	%	Tons	Tons	%	Tons	%	Tons	%	Tons
1954/1955	4777	4.22	108525	95.78	113302	7992	9.67	74641	90.33	82633	16496	12.20	118692	87.80	135188	29265	8.41	301858	86.75	16846	4.84	347969
1955/1956	7174	6.15	109446	93.85	116620	6646	11.39	51715	88.61	58361	23287	16.34	119232	83.66	142519	37107	11.11	280393	83.97	16401	4.92	333901
1956/1957	5467	4.21	124408	95.79	129875	3626	6.90	48942	93.10	52568	18083	14.20	109225	85.80	127308	27176	8.37	282575	87.08	14744	4.55	324495
1957/1958	8941	4.99	170219	95.01	179160	2657	10.04	23815	89.96	26472	23104	13.37	149708	86.63	172812	34702	8.81	343742	87.22	15659	3.97	394103
1958/1959	10973	4.28	245349	95.72	256322	569	6.62	8029	93.38	8598	25786	15.99	135502	84.01	161288	37328	8.44	388880	87.98	15786	3.58	441994
1959/1960	7306	3.17	223499	96.83	230805	1301	3.78	33087	96.22	34388	20867	11.84	155402	88.16	176269	29474	6.46	411988	90.41	14226	3.13	455688
1960/1961	4907	2.20	218268	97.80	223175	1732	3.60	46392	96.40	48124	17377	9.43	166861	90.57	184238	24016	5.10	431521	91.88	14116	3.02	469653
1961/1962	4574	3.36	131428	96.64	136002	6138	16.11	31957	83.89	38095	14185	8.92	144751	91.08	158936	24897	7.19	308136	89.04	13022	3.77	346055
TOTAL	54119		1331142		1385261	30661		318578		349239	159185		1099373		1258558	243965		2749093		120800		3113858
AVERAGE	6765	3.91	166393	96.09	173158	3833	8.78	39822	91.22	43655	19898	12.65	137422	87.35	157320	30496	7.83	343637	88.29	15100	3.88	389233

TABLE "II"

STATISTICS OF EGYPTIAN COTTONS LOCAL CONSUMPTION BY GRADES AND STAPLE LENGTHS

	LONG STAPLE VARIETIES					LONG MEDIUM STAPLE VARIETIES					MEDIUM STAPLE VARIETIES					TOTAL OF ALL VARIETIES				MIXED LOW MIXED & SCARTO		GRAND TOTAL
	up to FGF/G		over FGF/G to Extra		Total	up to FGF/G		over FGF/G to Extra		Total	upto FGF/G		over FGF/G to Extra		Total	up to FGF/G		Over FGF/G to Extra				
	Tons	%	Tons	%	Tons	Tons	%	Tons	%	Tons	Tons	%	Tons	%	Tons	Tons	%	Tons	%	Tons	%	Tons
1955/1956	2978	89.48	350	10.52	3328	4457	56.49	3433	43.51	7890	31116	46.39	35965	53.61	67081	38551	44.61	39748	46.00	8110	9.39	86409
1956/1957	3706	65.33	1967	34.67	5673	6946	65.68	3630	34.32	10576	35853	58.28	25663	41.72	61516	46505	52.01	31260	34.96	11658	13.03	89423
1957/1958	5087	54.83	4191	45.17	9278	2434	25.08	7270	74.92	9704	38144	57.15	28605	42.85	66749	45665	47.44	40066	41.62	10531	10.94	96262
1958/1959	8391	49.28	8636	50.72	17027	1635	38.43	2619	61.57	4254	45745	61.51	28619	38.49	74364	55771	54.12	39874	38.69	7409	7.19	103054
1959/1960	4075	23.53	13245	76.47	17320	387	14.84	2220	85.16	2607	22060	27.20	59035	72.80	81095	26522	24.96	74500	70.11	5234	4.93	106256
1960/1961	1963	14.75	11348	85.25	13311	1328	21.37	4887	78.63	6215	15710	16.75	78092	83.25	93802	19001	15.87	94327	78.79	6385	5.34	119713
TOTAL	26200		39737		65937	17187		24059		41246	138628		255979		444607	232015		319775		49327		601117
AVERAGE	4367	39.74	6623	60.26	10990	2864	41.66	4010	58.34	6874	31438	42.43	42663	57.57	74101	38669	38.60	53296	53.20	8221	8.20	100186

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UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

SUMMARY

Agenda Item: D.6.1.

United Arab Republic

METHODS OF IMPROVING THE QUALITY OF LOW GRADE EGYPTIAN COTTON PRODUCTS, THROUGH IMPROVED METHODS OF PROCESSING

By I.A.H. SHAHIN, M.Sc.
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Misr El Beida Dyers

SUMMARY

Lower grades of Egyptian cotton varieties represent about 12% of the total cotton production and amounts to the substantial amount of 45.000 tons yearly. These cottons are not usually available for the export market and are almost entirely locally consumed. This serves a two fold purpose; consuming the lower cotton grades which, though progressively decreasing from year to year, yet represent non too negligible amount of the national income and to make available fabrics cheap enough to be within the buying power of the lower income groups of the population.

The quality of these fabrics has been substantially improved through methods of processing, and the inferior quality expected from using such lower grades of cotton is minimized to a great extent and the final fabrics are cheap, relatively strong, pleasing and readily saleable.

Difficulties in processing such diversent qualities of raw material are expected and arise from the fact that such cottons have in common, to varying extents, the following features: high percentage of immature and dead fibres, fibres on the coarser side of the fineness scale, higher discrepancy in fibre length uniformity and higher percentage of impurity contents.

The measures taken to overcome these difficulties and the practice adopted by some textile mills in the UAR may be summerized as follows:

a. Spinning and Weaving:

1. Blowing room: Effecting efficient opening and cleaning in the blowing room by: strict blending procedure, adjusting speeds and settings of spiked lattices to minimize idle time and hence more effective cleaning; by passing and/or replacing severe-action beaters by combination of porcupine, kirschner

and saw-teeth type beaters; producing lighter laps of about 400 grams/M.

2. Card room: Ensuring favourable carding conditions by: lowering rate of production to the order of 4 kg/card/hr.; using metallic card clothing in preference to flexible foundation clothing or otherwise fitting the card with a continuous stripping device; raising taker-in speed up to 650 rpm; setting the mote-knives closer; altering the settings of back and front sheets to keep the nep count, down. The card sliver thus produced would be of improved draftability due to more effective fibre to fibre isolation, and the nep count should not be much more than that of the scutcher's lap.

3. Drawing, speed and ring frames: Utilization of efficient drafting systems on the drawing; speed and ring frames is essential since the card slivers, though much improved in quality, yet they are still inferior to those produced from the higher grades of cotton, and better fibre control is made possible by using the 3 over 4 and double apron drafting systems on drawing, speed frames and spinning frames respectively.

4. Weaving and weaving preparation: Special care is given to yarn clearing and warp preparation especially sizing. The improved weaving preparation will permit power looms to work with reasonable efficiency. The grey cloth thus produced is less dirty but sufficiently strong for its end uses.

b. Finishing:

The relative importance of various finishing processes and how to get the maximum benefit out of each, if applied to low grade cotton fabrics, may be summarized in the following:

1. Bleaching: Low grade cotton fabrics, naturally contain more in sizing material, impurities and hairiness. These conditions necessitate efficient cleaning, brushing and shearing to remove the most parts of impurities, knots and hanging threads. Singeing follows to remove surface fibres; then efficient desizing is imperative to the success of the subsequent bleaching and dyeing operations. The addition of caustic soda, sodium silicate and surface active agents, in the kier boiler, would realize the best results in removing dirts and oily stains.
Then, bleaching would be on easy operation, and is generally performed by using hypochlorite.

2. Mercerising: Full mercerisation is not generally practiced, but semi-mercerisation is often used to serve manifold purposes:

a - increasing dyestuff absorption
b - removing rope creases in cloth
c - reducing bad response of dead fibres of dyeing
d - increasing the tensile strength and elasticity of cloth.

3. Dyeing: Contrary to the common belief, low grade cotton fabrics should be dyed with dyestuffs of fairly good fastness, as their service conditions necessitate more frequent hand washing and more exposure to sunlight. The resistivity of immature and dead fibres to dyestuffs, represents a major difficulty encountered in dyeing. Semi-mercerisation would help to a certain extent in solving the problem. The rest depends on the appropriate selection of dyestuffs to be utilized.

4. Printing: Printing process, by its nature, tends to cover the inferiorities in cloth texture, and thus, is considered to be the process most widely adapted for this class of fabrics. Practice in printing and recommended dyestuff are given in the text.

5. Finishing and dressing: Among the various effects obtained from finishing processes, the following are considered representing the general practice:

(a) Filling: the filling materials commonly used are starch and dextrine; glue is added in small amounts, to increase stiffness. This type of finish is not permanent.

(b) Softening: if soft finishes are required, softeners such as, turkey red oil, or synthetic softeners are added to the dressing composition.

(c) Optical whitening: agents are often added in the dressing composition to increase the degree of whiteness for white goods or printed goods with white ground.

(d) Lustering: is performed on calenders to varying extents. A special calendering, called chasing, is utilized to enhance the cover to low cotton grade fabrics.

(e) Raising: is one of the most successful finishes applied to low grade fabrics, the advantage being that raising conseals almost entirely the inferiorities of fabric texture.

(f) Surface coating: apart from clothing purposes, low grade cotton fabrics are coated with synthetic resins, for manifold purposes in industry and household utilities.

(g) Flocking: low grade fabrics are much used as a ground for flocking which gives an imitation of velvet, and covers at the same time texture faults already present in ground fabrics.

TABLE "I"

PRODUCTION STATISTICS OF EGYPTIAN COTTONS CLASSIFIED BY GRADES AND STAPLE LENGTHS

SEASON	LONG-STAPLE VARIETIES					LONG-MEDIUM STAPLE VARIETIES					MEDIUM-STAPLE VARIETIES					TOTAL OF ALL VARIETIES				MIXED LOT MIXED & SCARTO		GRAND TOTAL
	Up to FGF/G		FGr/F to Extra		TOTAL	up to FGF/G		over FGF/G to Extra		TOTAL	up to FGF/G		over FGF/G to Extra		TOTAL	up to FGF/G		over FGF/G to Extra				
	Tons	%	Tons	%	Tons	Tons	%	Tons	%	Tons	Tons	%	Tons		Tons	Tons	%	Tons	%	Tons	%	Tons
1954/1955	4777	4.22	108525	95.78	113302	7992	9.67	74641	90.33	82633	16496	12.20	118692	87.80	135188	29265	8.41	301858	86.75	16846	4.84	347969
1955/1956	7174	6.15	109446	93.85	116620	6646	11.39	51715	88.61	58361	23287	16.34	119232	83.66	142519	37107	11.11	280393	83.97	16401	4.92	333901
1956/1957	5467	4.21	124408	95.79	129875	3626	6.90	48942	93.10	52588	18083	14.20	109225	85.80	127308	27176	8.37	282575	87.08	14744	4.55	324495
1957/1958	8941	4.99	170219	95.01	179160	2657	10.04	23815	89.96	26472	23104	13.37	149708	86.63	172812	34702	8.81	343742	87.22	15659	3.97	394103
1958/1959	10973	4.28	245349	95.72	256322	569	6.62	8029	93.38	8598	25786	15.99	135502	84.01	161283	37328	8.44	388880	87.98	15786	3.58	441994
1959/1960	7306	3.17	223499	96.83	230805	1301	3.78	33087	96.22	34388	20867	11.81	155402	88.16	176269	29474	6.46	411988	90.41	14226	3.13	455688
1960/1961	4907	2.20	218268	97.80	223175	1732	3.60	46392	96.40	48124	17377	9.43	166861	90.57	184238	24016	5.10	431521	91.88	14116	3.02	469653
1961/1962	4574	3.36	131428	96.64	136002	6138	16.11	31957	83.89	38095	14185	8.92	144751	91.08	158936	24897	7.19	308136	89.04	13022	3.77	346055
TOTAL	54119		1331142		1385261	30661		318578		349239	159185		1099373		1258558	243965		2749093		120800		3113858
AVERAGE	6765	3.91	166393	96.09	173158	3833	8.78	39822	91.22	43655	19898	12.65	137422	87.35	157320	30496	7.83	343637	88.29	15100	3.88	389233

TABLE "II"

STATISTICS OF EGYPTIAN COTTONS LOCAL CONSUMPTION BY GRADES AND STAPLE LENGTHS

	LONG STAPLE VARIETIES					LONG MEDIUM STAPLE VARIETIES					MEDIUM STAPLE VARIETIES					TOTAL OF ALL VARIETIES				MIXED LOW MIXED & SCARTO		GRAND TOTAL
	up to FGF/G		over FGF/G to Extra		Total	up to FGF/G		over FGF/G to Extra		Total	upto FGF/G		over FGF/G to Extra		Total	up to FGF/G		Over FGF/G to Extra				
	Tons	%	Tons	%	Tons	Tons	%	Tons	%	Tons	Tons	%	Tons	%	Tons	Tons	%	Tons	%	Tons	%	Tons
1955/1956	2978	89.48	350	10.52	3328	4457	56.49	3433	43.51	7890	31116	46.39	35965	53.61	67081	38551	44.61	39748	46.00	8110	9.39	86409
1956/1957	3706	65.33	1967	34.67	5673	6946	65.68	3630	34.32	10576	35853	58.28	25663	41.72	61516	46505	52.01	31260	34.96	11658	13.03	89423
1957/1958	5087	54.83	4191	45.17	9278	2434	25.08	7270	74.92	9704	38144	57.15	28605	42.85	66749	45665	47.44	40066	41.62	10531	10.94	96262
1958/1959	8391	49.28	8636	50.72	17027	1635	38.43	2619	61.57	4254	45745	61.51	28619	38.49	74364	55771	54.12	39874	38.69	7409	7.19	103054
1959/1960	4075	23.53	13245	76.47	17320	387	14.84	2220	85.16	2607	22060	27.20	59035	72.80	81095	26522	24.96	74500	70.11	5234	4.93	106256
1960/1961	1963	14.75	11348	85.25	13311	1328	21.37	4887	78.63	6215	15710	16.75	78092	83.25	93802	19001	15.87	94327	78.79	6385	5.34	119713
TOTAL	26200		39737		65937	17187		24059		41246	133628		255979		444607	232015		319775		49327		601117
AVERAGE	4367	39.74	6623	60.26	10990	2864	41.66	4010	58.34	6874	31438	42.43	42663	57.57	74101	38669	38.60	53296	53.20	8221	8.20	100186

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UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

Agenda Item: D. 11. 2

Israel

FACTORS DETERMINING THE USE OF FERTILIZERS IN UNDERDEVELOPED COUNTRIES

By Gershom SEGELMAN, B. Sc., M. Sc.,
Executive Director,
Fertilizer Development Council,
Beer Sheva, Israel

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No. 387 **FACTORS DETERMINING THE USE OF FERTILIZERS IN UNDERDEVELOPED COUNTRIES**

D.11.2.

Gershon Segelman, B.Sc. M.Sc.

Executive Director, Fertilizer Development Council,

Beer Sheva, Israel.

The use of fertilizer as the most rapid method for developing agricultural production has become axiomatic. Large-scale programmes carried out by a number of international agencies for many years show the importance that is given to this tool of production.

The Freedom from Hunger Campaign initiated last year by the F.A.C. of the United Nations bases itself upon the belief that the use of fertilizers can give an immediate and important rise to the production of food and fibre crops throughout the world.

Unfortunately, a number of problems often arise which have a tendency to negate the efforts and work put in by field demonstration units.

The following are the problems to be considered when introducing fertilizer in the newly developing countries:

1. To convince the farmers to use fertilizers.

Resistance to the introduction of any new methods among traditional land cultivators is well known throughout the world. Problems of local beliefs, of relationships between cultivator and owner, prestige of the tribal or village head, often have more to do with the acceptance of fertilizer use than the most outstanding field demonstrations. It is, therefore, important when making these field demonstrations to see that the local factors which might resist or even propagandize against the use of fertilizers be so integrated into the demonstration programme that they see the material and prestige benefits which can accrue to them as part of this programme. It is important that the field demonstrators be conversant with the local customs, psychology and social relationship in order that his work be successful.

2. Government olicy

Unfortunately, many governments while they give theoretical support to programmes of field demonstrations are convinced that only rapid industrialization can solve their problems and demands for higher living standards and have a tendency to overlook the importance of a strongly productive agricultural base for any industrialization. It is often necessary to convince the local governments that the first steps for industrialization can be based on a conversion of agricultural products and to show them the importance of having an agricultural economy where surplus above the subsistant level is available for use as an item for industrial conversion.

3. Transportation

Being under developed most of the young nations suffer from a very poor transportation system. In many countries the cost of fertilizers to the farmer is double that at the port of entry. Transportation is slow and often not reliable so that fertilizer materials may be available at the storehouses at the port but not available at the proper season in the field. Since building transportation systems are costly and long term it is necessary to convince government agencies that adequate transportation subsidies be paid in order to deliver the fertilizer at a price which is economic to the farmer.

4. Credit

In farming communities living on a subsistent level, or where such cultivator-owner relationships exist that one-quarter to one-half of the crop goes to the owner, conditions make credit facilities highly important. The usual procedure where absentee landowners prevail is for seeds and other materials to be provided on a basis of return after harvest at prohibitive interest rates. In order that fertilizer be introduced, credit facilities must be established by government or local co-operative agencies whose interest is minimal and whose first outlook is the raising of the farmers' productive capacity.

5. Sale of surplus products

Where fertilizer use and other modern methods of production are introduced and farm production rises above the needs of the local community saleable surpluses accumulate. The organization of the handling, transport and sale of these surpluses with adequate return to the farmer will often determine his continuing use of fertilizers and other modern methods. Here again proper transportation facilities, knowledge of what is marketable and sellers co-operatives can do much to give an adequate return to the farmer for his crop. Care should be taken to arrange markets for surplus crops before their production.

6. Fertilizer prices

The smaller, younger and poorer a country is the more expensive its fertilizer prices may be. Countries making large purchases of fertilizers on the world market can usually get maximum benefits from international competition. It is, therefore, of importance that fertilizer purchases where the local demands are still small be channelled through one purchasing agency which will be able to obtain best available prices by large-scale purchases. Price levels can also be maintained by purchasing highly concentrated materials and thus reducing shipping and handling costs. Often the buying of materials in bulk instead of bags and the bagging of the material in the purchasing country will do much to lower the cost of fertilizer

7. Level of extension service

The most expensive international aid programme will not succeed when it is not based on a strong, knowledgeable and enthusiastic local extension service. The extension specialist must know his area, his people and their problems, and not be afraid to demonstrate a particular farming technique with his own hands.

8. The personal enthusiasm of the farmer and the extension worker

Enthusiasm is a term hard to define. It is based on personality, beliefs, tradition, national atmosphere, and many other imponderable factors. One enthusiastic

extension worker can build around him a group of enthusiastic farmers who are willing to attempt new methods, who feel that they are participating in a goal larger than their own personal interests and in the very young countries, especially, are participating in the national development. Each farmer and extension worker must be given the feeling that his accomplishment is meaningful for the country as a whole. Modern psychological techniques make use of advertising and public relations which can do much to make this local worker or farmer important in the eyes of the community and the nation as a whole.

The development of an adequate demonstration programme based on the enthusiastic extension worker can be economically developed for a group of countries as a whole having similar problems. These programmes might, in the beginning years, be carried out in countries which have faced and solved similar problems. To help solve problems of credit, transportation and prices it would be important to organize international seminars where the emphasis would be placed both on extension and organization of purchase and sale co-operatives and transportation problems.

Visits

The organization of visits by outstanding farmer cooperatives to neighbouring areas and countries, or even to more distant countries, can serve both as a reward for successful participation in a fertilization programme or as an incentive and teaching method to show these farmers how similar problems have been solved in other places.

And lastly

use of foreign specialists at a level not commonly accepted. Farmers or farm instructors from participating countries to work in the host countries at the farm level and to break the commonly accepted idea that research stations or government demonstration plots are somehow more productive than the cross-the-road farm cultivator. Where farm level instructors have been used in the last few years the results have been impressive and the enthusiasm has been directed at a level where the demand is greatest.

Each country has its own peculiar problems, and each country's extension worker should be the best person to help overcome these problems. Where the international community can help is to show the local man how these problems have been overcome in other countries and to give him the belief and hope that he, too, can service as a catalytic agent in his country for improving his peoples' standard of living.

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UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

SUMMARY

Agenda Item: D.11.2. Israel

FACTORS DETERMINING THE USE OF FERTILIZERS IN UNDERDEVELOPED COUNTRIES

By Gershon SEGELMAN, B.Sc., M.Sc.,
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FACTORS DETERMINING THE USE OF FERTILIZERS IN UNDERDEVELOPED COUNTRIES

Gershon Segelman, B.Sc. M.Sc.
Executive Director, Fertilizer Development Council,
Beer Sheva, Israel.

Summary

The use of fertilizers as the most rapid method for developing agricultural production is axiomatic.

The following are the problems to be considered when introducing fertilizer use in developing countries:

1. To convince farmer to use fertilizers
2. Government policy
3. Transportation
4. Credit
5. Sale of surplus
6. Fertilizer prices
7. Level of extension service
8. Personal enthusiasm of farmer and extension worker

The demonstration program has to be executed in several countries simultaneously for a duration of several years, and at the same time modern agricultural machinery must be introduced. Such a program would involve the following problems:

1. Education of extension workers in countries having similar problems like the developing countries, i.e. Israel

2. Organization of schools for soil technicians with emphasis on problems like purchase and sale cooperatives and credit and transportation cooperatives.

3. Visits of large groups of farmers to areas where problems similar to their own have been solved.

4. Employment of foreign experts to work on farms together with students who have returned to their own countries.

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Agenda Item: D.1

United Arab Republic

SPECIAL FACTORS AFFECTING INDUSTRIAL DEVELOPMENT IN LESS DEVELOPED AREAS WITH SPECIAL REFERENCE TO UAR

By Y. EL-MOLLA, Ph. D.,
Under Secretary of State,
Ministry of Industry, UAR

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SPECIAL FACTORS AFFECTING INDUSTRIAL DEVELOPMENT IN LESS DEVELOPED AREAS WITH SPECIAL REFERENCE TO U.A.R.

No 380

Y. El-Molla, Ph.D.
Under Secretary of State
Ministry of Industry, U.A.R.

D.1.

1. In the process of raising the standard of living of their population, the developing countries meet several problems. In many cases, and in spite of the willingness to develop and even apart from the obstacles exerted by external pressure from circles whose interest is contrary to such development, developing countries have problems of their own; problems inherited by their economic and social conditions. Some of these problems are purely economical while others are social or institutional.

2. In UAR for example, it was the desire of imperialism that our country should remain an agricultural one. Generations used to learn, one generation after the other, that the land is the only source of wealth. In such an inherited social atmosphere, the State has found great difficulty in convincing wealthy people to explore new fields of investment and to use their money in industry. This factor is, by no means, of little importance. In our industrial experience we had - in several cases - to hold meetings with those who have available funds for investment to convince them of the benefits of industrial investment not only to themselves but to their country at large. In many cases we succeeded. New investors, previously reluctant to industrial investment, have found their way in this field. However, it was not an easy task.

3. The main economic obstacle, and the general one too, in the way of industrial development in our case is the low level of savings out of the national income which is, by itself, very low. As it is known, every does of investment needs an equal dose of savings. On the other hand, developing countries may be reluctant to impose restrictions on importations from abroad and this will lead to the depletion of foreign currency. But in order to start a programme for development, a special fund of foreign currency should be set aside and the intervention of the State to build up these reserves might be necessary.

4. In the first stage of our industrial development, it was found necessary, in order to encourage individuals to save and invest in industry, to follow a method of co-partnership in financing between the State and the individuals. This gave a sort of guarantee for individuals who were, by their very nature, reluctant to investment in industry.

5. Industrial development is, no doubt, the goal of all developing countries and it must be so since it is the economic sector which gives the highest returns to the national income and to the standard of living; yet there are certain fundamental elements on which sound development must be established This means that there are factors which restrict, more or less, the potentialities of developing countries for development in new fields and limit their possibilities in this connection.

6. The first factor in this respect is the availability of at least a great portion of the raw materials required for the establishment of industrial projects, because the establishment of industries which entirely depend on imported materials will, in many cases, subject these industries to large difficulties, Experience has proved that there are some raw materials in the developing countries which can be utilized in industry and yet, for some reasons, they had not been exploited for this purpose.

7. As mentioned before, the low size of savings constitutes another limiting factor in this connection. However this factor too, can be overcome by resorting to loans and credit facilities on a large scale. It has been proved, in many cases, that a successful industrial project which is established on sound basis can be self-financing in a few years. If this is the case, there will be no harm to developing countries if they resort to loans on condition that development projects are based on sound economic basis.

8. There is also an important problem that faces almost all developing countries, namely, the lack of local technical know-how which is only available in highly developed countries. Of course, other countries whose national wealth has been depending, for many years, on the primary operation of exploitation of land, forestry or mining, would not have the opportunity to build up any important group of technicians who can be relied upon in the establishment of development projects.

9. It should be stressed that the above mentioned obstacle imposes itself on developing countries in the different stages of development; whether it be in the first stage of planning, or in the second stage of execution or in the operation of the projects themselves after their erection. In all these stages, personnel of high technical abilities are required.

10. In UAR we were confronted by many obstacles of this sort. However, in the first stage, (planning) we have succeeded in overcoming the difficulty by mobilizing all the required qualifications available in the country. In the stage of execution, it was necessary to resort to technicians from abroad, so we had to bring along with the machinery and equipment imported the technicians and erectors required to do the job. With the help of young technicians from our country who had to assist these people, we were able to carry out the scheduled programme. In having foreign experts there is a sure benefit for developing countries since they offer a good opportunity for local personnel to be trained. In future, the local trained personnel could do similar jobs by themselves. In the third stage (operation) it was necessary too to have some foreign experts especially in

new industries in which we have no previous experience. In such cases, it should be a policy to attach local personnel to foreign experts in order to acquire, in few years, the experience needed for the operation of such projects.

11. Very close to the above subject, is the difficulty in securing managerial capacities. Contrary to the previous case of technical experience, imported managerial capacities are not, in all cases, accepted. For political and social reasons developing countries might prefer to have indigenous managerial personnel. This presents a very serious problem, since managerial capacities are not easily acquired. However, having this in mind, developing countries could always, ahead of time, arrange to acquire such capacities by special training courses. I wish to emphasize that securing these capacities must be thought of at the very first stage of planning.

12. Next comes another important factor. As the available resources of development are, by nature, limited in developing countries, the question of priorities, right from the beginning,

imposes itself on those who work out the programmes or plans of development. It is of course known that some factors have a given priority, at least from a theoretical point of view. But to base our comparison only on these theoretical factors might not necessarily lead us to very successful results. In drawing up our first industrial development plan we were faced with this problem. After a thorough study of our economic and social conditions and in the light of our available resources, we were able to designate the elements of priority. However, it was found out that all projects indicate, more or less, priority elements at different relative proportions, and this was not, of course, sufficient to evaluate the degree of importance for each project. Consequently, we had to adopt a new method based on quantitative terms in order to determine the importance of each project in relation to other projects, Annexe 1 explains the method used for the calculation of priorities.

13. The elements of priority may differ from one country to another, but we believe that the method followed can be applied in all cases. Of course, the weight of each element in the priority system could be decided upon according to the economic conditions of each country. In this connection too, the State has provided a study form for the economic and technical evaluation of industrial projects (Annexe 2). This form is used in the implementation of the policy of industrial planning in the country because, since the resources for development are limited, as we have mentioned before, then it becomes the duty of the developing countries not to approve industrial projects except if they are founded on sound basis of economical evaluation. In UAR, the Law of the Organization and Promotion of Industry was issued in 1958, having as a goal, the best utilization of the economic resources of the country. By this law industrial investment is subjected to the direction of the State. At the same time, the law furnishes all possible means of encouragement for industrial investment.

14. In the last stage of development, the developing countries confront many marketing difficulties whether local or foreign. It is quite natural that these countries face difficulties in foreign markets whether in obtaining the raw materials of the required specifications or in competing with highly developed countries with unknown products to foreign markets. This sort of difficulty is conceivable but what is not conceivable is the difficulty which encounters newly industrial products in the local market. However, this difficulty exists on account of some psychological and inherited factors which make the local consumer prefer the imported goods to which he has been accustomed for many years. This factor, psychological to some extent, is one of the most important problems which confronts local industrial production in developing countries. In many cases, it is necessary that restrictions should be imposed, even by compulsory methods, to divert the consumer's preference from imported to local products. Moreover, there are the interests of important merchants, importers and monopolists which contradicts the interest of the national economy. Since these developing countries have no access or experience in the international markets, they are liable to face many difficulties in disposing of their surplus industrial products.

15. One of the most determining factors in development programmes is the access of the developing country to foreign currency reserves. In fact, this factor determines whether development is possible or not. In the first stage of development, it is necessary, as a rule, to import all the machinery and equipment. This requires foreign currency. Development could then, be only achieved, primarily, within the limits of the available foreign currency. The main source of foreign currency in each country is, of course, limited by its cash reserves and its balance of payments proceeds. Since, in the first stage of development, the developing country would be still in need of considerable quantities of imported consumable goods, there will be only a minor surplus in its balance of payments not adequate for any important development programme. If we add to this the relatively heavy requirements of investment goods for the development programmes, the developing country will be in no position to meet all the foreign currency requirements from its normal trade transactions.

16. There are, of course, some outlets for these difficulties. One can resort to foreign loans if they are long-termed and can be refunded, together with their interests, from the production of the industrial products themselves. One can also utilize the foreign credit facilities on a large scale; as by such means, countries can obtain more of investment goods necessary for development projects. It is also possible to welcome foreign investments from developed countries on basis of effective partnership which realizes the interest of national economy.

17. In the planning of industrial projects themselves, a solution for the above problems can be found by giving priority in execution to those projects which will give a large excess of foreign currency or which result in a reduction of imported goods.

18. In our industrial programmes, priority in execution was given to many consumers' goods projects since these are more effective in saving foreign currency in a short period. Therefore we believe that it is not necessary to give priority in execution to basic industries as has been the way in some industrial plans.

19. In this respect, we should emphasize the tendency for inflation which usually accompanies development programmes. Care must be always exercised that the monetary policy should be wise and elastic enough to face inflationary effects since the existence of inflation increases the burdens of development and raises its costs.

20. One of the requirements of development is the elimination of rigidities which prevail the domaine of business in developing countries. Work procedures should be adapted to the requirements of industrial development. For example, the sectors of banking, public utilities, technical education, importation, exportation and labour, should be adjusted in parallel to the conditions imposed by industrial development.

21. Another problem which developing countries have to face is the solution of the controversy present in some cases between economic welfare and total welfare. Industrial development will certainly impose some restrictions on individuals whether in the domaine of consumption, importation, exportation or investment itself. Moreover, it happens, in many cases, that the prices of local products are higher than those of the corresponding imported ones especially in the early stage of development. All of this should be endured by the local consumer in order to attain the ultimate objectives of the industrial development.

22. One of the annoyances which development programmes impose is the intervention of the State or public bodies in the economic behaviour of individuals. Planning is naturally required in economic societies of limited resources. Investors will suffer to a certain degree. Both investors and consumers will bear some of the consequencies of these conditions.

23. Developing countries are in persisting need for foreign aid whether financial or technical. Highly developed countries should not hesitate to offer this aid since by such cooperation, the developed countries will contribute to the welfare of a great portion of world population.

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SUMMARY

Agenda Item: D.1.

United Arab Republic

SPECIAL FACTORS AFFECTING INDUSTRIAL DEVELOPMENT IN LESS DEVELOPED AREAS WITH SPECIAL REFERENCE TO U.A.R.

By Y. EL MOLLA, Ph.D.
Under Secretary of State,
Ministry of Industry, U.A.R.

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Under Secretary of State
Ministry of Industry, UAR.

SUMMARY

Industrial development is, no doubt, the goal of all developing countries and it must be so since it is the economic sector which gives the highest returns to the national income and to the standard of living. However, in planning and carrying out development programmes, the developing countries confront so many obstacles or limiting factors which restrict, more or less , the potentialities for development. Local conditions should be thoroughly studied and each factor should be properly weighed.

Limiting factors may be either external or local or they may be either economical or institutional. The major limiting factors are:

a) The extent of the availability of raw materials

b) Financing

This is a decisive factor. The lack of foreign currency and the small size of savings are large obstacles. In developing countries the balance of payments surplus, in the early stage of developments, is usually inadequate for any important development programme.

Financing can be secured by the following means:

a) imposing restrictions on importation

b) welcoming foreign investment on basis of effective partnership

c) resorting to loans and credit facilities.

There is no harm in resorting to loans and credit facilities on large scale so long as the projects are carefully studied and are established on sound economic bases, because successful projects can be self-financing in a few years. Long-termed loans are appreciated especially if they can be refund from the production of the development projects themselves.

Technical know-how.

The lack of local technical know-how is a problem that imposes itself on developing countries in the different stages of development (planning, execution and operation). The problem can be solved by getting foreign experts and technicians from those countries which supply the machinery and equipment. There is a sure benefit in having foreign experts since they can train local technicians who can, afterwards, execute similar projects.

Managerial capacities.

Contrary to technical experience, imported managerial capacities

are not, in all cases accepted. This presents a very serious problem since managerial capacities are not easily acquired. However, arranging special training courses will be very useful in securing these capacities.

Technique. of planning.

Right from the very beginning, the problem of priorities will certainly impose itself on those who are planning development projects. In UAR we had to adopt a new method based on quantitative terms in order to determine the importance of each project in relation to other projects. The method can be applied by any other country giving that the weight of each element in the priority system should be decided upon according to the economic conditions of each country.

In this respect also, the State has provided a study form for the economic and technical evaluation of industrial projects.

Marketing.

It is quite natural that a developing country will face difficulties in foreign markets as the newly-produced articles have to compete in quality and in price, with highly established products and, in many cases, of world-wide reputation. Even local marketing may be also difficult as the local consumer may be reluctant to switch over from goods he has been accustomed to use since so many decades to local products quite new to him. In addition, the prices of local products may be higher than those of the corresponding imported ones.

In many cases, it may be necessary to impose restrictions to divert the consumer's preference from imported to local products.

Inflation.

Development programmes are usually accompanied by tendencies for inflation. Care must be exercised that the monetary policy should be wise and elastic enough to face inflationary effects since the existence of inflation increases the burdens of development and raises its costs.

Rigidities and institutional factors.

Institutional factors inherited since so many centuries may become a serious problem.

The elimination of rigidities which prevail the domaine of business is also an important factor. Work procedures, in all sectors, should be adapted to the requirements of industrial development.

Naturally, planning is required in economic societies of limited resources. This planning may impose certain restrictions on individuals in various domains. However, such restrictions should be endured by individuals in order to attain the ultimate objectives of economic development.

Developing countries are in persisting need for foreign aid whether financial or technical. Highly developed countries should not hesitate to offer this aid since by such cooperation, the developed countries will contribute to the welfare of a great portion of world population.

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CONFÉRENCE DES NATIONS UNIES
SUR L'APPLICATION DE LA SCIENCE ET DE LA TECHNIQUE
DANS L'INTÉRÊT DES RÉGIONS PEU DÉVELOPPÉES

Point de l'ordre du jour : D.1.3

Sénégal

FACTEURS ET CRITERES D'ADAPTATION AU TRAVAIL INDUSTRIEL DANS LES PAYS EN VOIE DE DEVELOPPEMENT

Par J. GRISEZ,
J. GUILBOT,
et A. HAUSER,
République du Sénégal

Les mémoires rédigés à l'intention de la Conférence des Nations Unies sur l'application de la science et de la technique dans l'intérêt des régions peu développées sont des documents de travail. Ils sont publiés tels qu'ils ont été présentés et les assertions et opinions qu'ils contiennent sont celles de leurs auteurs.

NOTES

1. Les mémoires choisis pour être présentés en séance générale pourront être obtenus à la Conférence dans les langues officielles suivantes des Nations Unies: anglais, espagnol, français et russe.

2. Les mémoires choisis pour être présentés en séance spéciale pourront être obtenus à la Conférence dans l'une seulement de ces langues officielles.

3. Les résumés qui ont été rédigés pour tous les mémoires par les auteurs de ceux-ci pourront être obtenus à la Conférence dans les langues officielles suivantes des Nations Unies: anglais, espagnol, français et russe.

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FACTEURS et CRITERES d'ADAPTATION au TRAVAIL INDUSTRIEL

dans les PAYS en VOIE de DEVELOPPEMENT

par J. GRISEZ, J. GUILBOT et A. HAUSER
(République du Sénégal)

1. LES ENSEIGNEMENTS des ETUDES sur l'ABSENTEISME EFFECTUEES en AFRIQUE au S/D du SAHARA

a) L'absentéisme et la mobilité de la main-d'oeuvre peuvent être considérés comme des critères d'adaptation au travail industriel. Il faut entendre le phénomène de l'adaptation dans un sens très large, non comme le simple ajustement d'un organisme aux conditions de travail, mais comme une adéquation entre formes de production, situations et besoins individuels et sociaux, et ressources humaines.

b) Des études sur l'absentéisme et la mobilité des travailleurs fournissent des indices de cette adéquation, facilitant des comparaisons avec les pays industrialisés et permettent la recherche des facteurs individuels, industriels et sociologiques de ces phénomènes considérés comme critères d'adaptation.

c) Les taux d'absentéisme peuvent être relatifs aux entreprises ou aux individus.

Dans le premier cas, ils permettent d'évaluer le nombre de jours de travail perdus (taux de durée) ou la fréquence des interruptions de travail (taux de fréquence). Ces taux peuvent être calculés pour des entreprises considérées comme typiques ou, ce qui est préférable, relativement à un échantillon d'entreprises. Par ailleurs les taux d'entreprises peuvent être mis en relation avec des caractéristiques globales relatives à chaque entreprise ce qui permet de mettre en évidence les facteurs industriels de l'absentéisme et de la mobilité.

Les taux individuels d'absentéisme (en fréquence et en durée) servent à l'étude des facteurs individuels de l'absentéisme. Les taux de mobilité sont relatifs aux entreprises. Ils traduisent l'importance des mouvements de personnel (turnover). Ils peuvent être mis en relation avec des variables d'entreprise ou des caractéristiques de groupes.

d) L'intérêt des études d'absentéisme et de mobilité est non seulement d'ordre économique mais également d'ordre sociologique dans la mesure où elles permettent de mettre en évidence les facteurs d'adaptation au travail industriel dans les pays en voie de développement.

e) Des enquêtes ont été effectuées récemment en Afrique au Sud du Sahara et en particulier, par les auteurs du présent mémoire, au Sénégal et en Afrique Equatoriale. Les principaux enseignements que l'on peut retirer de ces études sont les suivants:

i Enseignements d'ordre économique

a) Pour les entreprises étudiées l'absentéisme et la mobilité se sont révélés semblables à ceux des entreprises des pays industriellement développés. Il en est en particulier ainsi pour les industries manufacturières de la région de DAKAR qui ont fait l'objet de l'enquête. En ce qui concerne les entreprises situées en milieu rural, les taux d'absentéisme se sont montrés plus élèves que dans les régions urbaines.

b) La corrélation entre l'absentéisme et la mobilité s'est révélée faible. Absentéisme et mobilité ne traduisent pas les mêmes phénomènes d'adaptation. Il y a une spécificité des critères par rapport aux phénomènes observés. L'absentéisme traduit les phénomènes d'adaptation à court terme, l'instabilité traduit les phénomènes d'adaptation à long terme.

ii Enseignements d'ordre sociologique

Les enseignements d'ordre sociologique concernant les facteurs d'adaptation au travail industriel dans les régions étudiées sont nombreux. Les plus importants sont les suivants:

a) Influence de la position de l'individu dans le cycle vital sur son comportement économique et social. L'âge de l'individu et sa situation matrimoniale sont des déterminants essentiels de l'absentéisme.

b) Importance de la qualification professionnelle (et niveau d'instruction qui lui est lié) pour l'adaptation au travail industriel. La qualification est un des facteurs les plus importants de la stabilité professionnelle.

c) Relations des comportements individuels avec la situation dans les groupes d'appartenance, en particulier par rapport au milieu coutumier ou au milieu urbain. Les résultats de l'enquête ont montré que les variables liées aux besoins de l'individu par rapport à son groupe d'appartenance (âge, état-civil, nombre d'enfants) agissent différemment en zone rurale et en zone urbaine.

L'adaptation au travail industriel est liée à la satisfaction des besoins personnels d'une part, et des besoins de groupe auxquels l'individu doit subvenir d'autre part. Les besoins individuels fondamentaux ont un

certain degré de généralité; les besoins en relation avec la vie d'un groupe sont beaucoup plus relatifs aux conditions économiques et sociologiques de la vie de ce groupe, notamment, pour l'Afrique, en situation rurale ou urbaine, coutumière ou extra-coutumière.

Les facteurs qui déterminent la position de l'individu dans l'entreprise et les conditions de vie professionnelles (statut professionnel, conditions de travail) sont les moins liés aux conditions sociologiques (en particulier, ils agissent semblablement en zone rurale ou urbaine), tandis que les variables liées aux besoins de l'individu par rapport à son groupe d'appartenance (âge, état-civil, nombre d'enfants) sont en rapport direct avec les situations sociologiques (en particulier elles agissent différemment en milieu rural et en milieu urbain) la jeunesse, le célibat, ou le faible nombre d'enfants qui entraînent une plus grande indépendance et moins d'obligations par rapport à un groupe de vie en zone urbaine et moins d'indépendance avec plus d'obligations en milieu rural et coutumier, agissent sur l'absentéisme, différemment et en accord avec ces situations inverses: plus d'absentéisme quand il y a plus d'indépendance et moins d'absentéisme quand les obligations sont plus contraignantes. L'un des résultats importants des enquêtes effectuées est donc de mettre en évidence le caractère global des phénomènes d'adaptation au travail industriel dans le pays en voie de développement. Il en résulte des directions de recherche pour l'étude de ces problèmes.

2. LES DIRECTIONS de RECHERCHES pour l'ETUDE de l'ADAPTATION au TRAVAIL INDUSTRIEL dans les PAYS en VOIE de DEVELOPPEMENT RAPIDE, d'APRES les ENQUETES sur l'ABSENTEISME et l'INSTABILITE de la MAIN-d'OEUVRE

a) Le phénomène de l'adaptation au travail industriel dans les pays peu développés devrait être abordé en tenant compte d'une manière beaucoup plus approfondie des conditions économiques et sociologiques propres aux pays en voie d'industrialisation.

b) Il faudrait étudier, en particulier, en fonction des diverses situations résultant de l'inégal développement de l'industrialisation (implantation des industries, urbanisation, rapports entre économie moderne et économie de subsistance) et en fonction des structures d'avenir économiques et sociales, les points suivants:

i La signification individuelle et sociale de la vie professionnelle et de la formation professionnelle. L'absentéisme et la mobilité professionnels sont très liés à la signification individuelle et sociale des situations de travail. Ce sont ces significations qu'il faut atteindre pour comprendre les phénomènes d'adaptation.

ii Les besoins des individus et des groupes en relation avec les divers types de situations économiques et sociales. Les besoins des individus et des groupes qui déterminent leur comportement varient selon les

situations économiques et sociales. C'est une analyse complète de l'ensemble de ces situations qui doit être effectuée pour étudier les problèmes d'adaptation.

iii Les situations créées par l'appartenance des individus à des groupes socioliquement et économiquement différents et en voie d'évolution. Une attention particulière doit être portée, dans les pays en voie de développement, à la coexistence de milieux sociologiquement et économiquement différents. C'est la situation globale des individus qui conditionne l'adaptation au travail industriel.

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Senegal

FACTORS AND CRITERIA OF ADAPTATION TO INDUSTRIAL WORK IN COUNTRIES UNDERGOING DEVELOPMENT

By J. GRISEZ,
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Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

NOTES

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FACTORS AND CRITERIA OF ADAPTATION TO INDUSTRIAL WORK IN COUNTRIES UNDERGOING DEVELOPMENT

By
J. GRISEZ, J. GUILBOT AND A. HAUSER
REPUBLIC OF SENEGAL.

SUMMARY

LESSONS OF THE STUDIES MADE IN AFRICA SOUTH OF THE SAHARA

Enquiries into absenteeism and mobility of labour in various industries have yielded precise information concerning the relations between these criteria of adaptation and a large number of individual, industrial and sociological factors.

2. DIRECTIONS OF RESEARCH ACCORDING TO THE RESULTS OF THE AUTHORS

The phenomenon of adaptation to industrial work in less developed countries should be approached by paying much more serious attention to the economic and sociological conditions peculiar to the countries undergoing industrialisation.

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